

Appendix J
Draft Fish Monitoring Plan
(From IS/EA Document)

INTRODUCTION

The Robinson Site is a 2 mile river restoration project located immediately upstream of the State Highway 59 Bridge on the Merced River, 6 miles southwest of the town of Snelling. The project will improve river and floodplain dynamics, increase and improve salmonid spawning and nursery habitat, reduce mortality of juvenile salmon due to predation, and enhance the riparian corridor. This project is the second of several contiguous projects in the area that have been collectively called the Merced River Salmon Habitat Enhancement Project. When combined, the habitat project will improve over 4.5 miles of important aquatic and riparian habitats on the lower Merced River. The goal for the Robinson Reach is to reform the river into a more natural, functional reach with well defined channels and floodplain, which would be beneficial to the salmon of the Merced River. Specific biological/ecological objectives of the Merced River Project are:

- Eliminate or isolate juvenile salmon predator habitat.
- Improve the adult and juvenile migratory path.
- Increase the quantity and quality of spawning habitat for chinook salmon by adding spawning gravel, reconfiguring spawning beds, and the river course.
- Increase the quantity and quality of rearing habitat for chinook salmon by increasing available in-channel diversity.
- Improve river and floodplain dynamics by reconfiguring the channel to better conform with the present flow regime.
- Create and enhance riparian and seasonally inundated vegetation by increasing the area within the project site that will be wetted by the river during high flows.

The Robinson site is located from RM 42 to 44. The area is characterized by an upstream section with an abandoned point bar and incised channel, a wide, flat, shallow central reach and several in-stream ponds in the downstream each. The current alignment bypasses much of the pre-1997 channel, and, therefore most of the coarse sediment and existing spawning and rearing habitat. This reach has several gravel pits that provide habitat for non-native warmwater fishes, a highly braided channel, several abandoned channels, and exhibits sheet flow in areas that lack a defined channel. The lack of a defined channel made it necessary for CDFG to cut an emergency channel through the area to allow for Fall-run chinook salmon passage.

Approximately 12,200 feet of channel will be modified to create: 21,900 yds² of spawning habitat; incorporation of spawning riffles, runs, and pools; and a meander that fits the current flow regime. Approximately 64.9 acres of salmonid predator habitat will be removed by filling instream ponds. The floodplain would be enhanced and revegetated with native riparian plant species, increasing the available riparian habitat in the area. Several scour channels will also be constructed, which are intended to act as seasonal wetlands. An estimated 1 million tons of on-site material will be manipulated during construction. Construction in this reach will require two full summer seasons.

Construction is scheduled to begin in May 2001 and will likely run through to September 2001, will resume in May 2002, and will be completed in September 2002.

MONITORING AND EVALUATION

The principal objective of this project is to return this reach of river to anadromous fish habitat to improve the survival of out-migrating fall run chinook salmon smolts.

Additional objectives are:

- 1) to create salmonid spawning and restore rearing habitat;
- 2) to improve existing salmonid spawning and rearing habitat;
- 3) to improve chinook salmon migratory pathway;
- 4) to improve floodplain and river dynamics in the lower Merced River.

In order to determine if the principal and first three additional objectives of the project are met, the following biological monitoring techniques will be conducted three times before project construction and for (at least) three years following project completion:

- Several groups of MadaJet and Photonic marked and coded wire tagged salmon smolts will be released in the Merced River above the project site and recovered (trapped) in rotary screw traps below the project site; survival rates and migration rates (distance/time) will be estimated.
- Temperature profiles of the Merced River will be taken above and below the project site; pre and post project data will be compared;
- Water quality monitoring in the Merced River below the project site will be conducted during the post project monitoring;
- Visual survey (escapement survey) of spawning activity at the project site; pre and post data will be compared.

Biological/Fisheries Monitoring Plan and Quality Assurance Program

Objective 1 of this project is to improve the survival of out-migrating, fall-run chinook salmon smolts.

Hypothesis 1: Following restoration at the project site, physical water quality; water velocity, depths and temperature conditions will become more favorable for anadromous and resident salmonids.

Monitoring/Data collection: Physical characteristics of the specific reaches will be analyzed utilizing a portable Hydrolab®. This will record temperature and basic water quality at suitable locations within the study reaches that will be collected monthly. Flow velocities and depths, evaluated in a separate program, will be incorporated into this evaluation.

Hypothesis 2: As a result of changes in physical conditions more salmon smolts will survive through the project site after the project is completed.

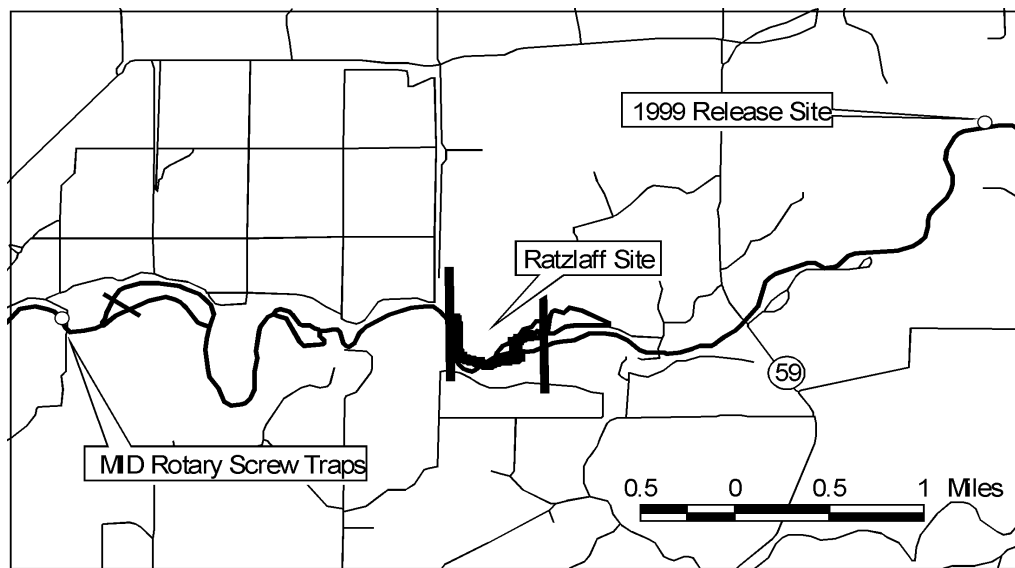


Figure1. Merced River, 1999 release sites and recovery site

Pre-project release will be done as part of the Ratzlaff Reach monitoring during the spring 2000-2002 out-migrant seasons. Robinson Reach post-project will occur during spring out-migrant seasons 2003-2005. For these studies, 3 specific reaches will be tested to evaluate survival of chinook salmon smolts. The reaches will incorporate both restored and unrestored reaches as controls. Evaluated reaches will include the Merced River Hatchery to Snelling (Hatchery Reach), Snelling to Robinson/Gallo (Snelling Reach), and Robinson/Gallo to the RSTs (Robinson/Gallo Reach) (figure 2).

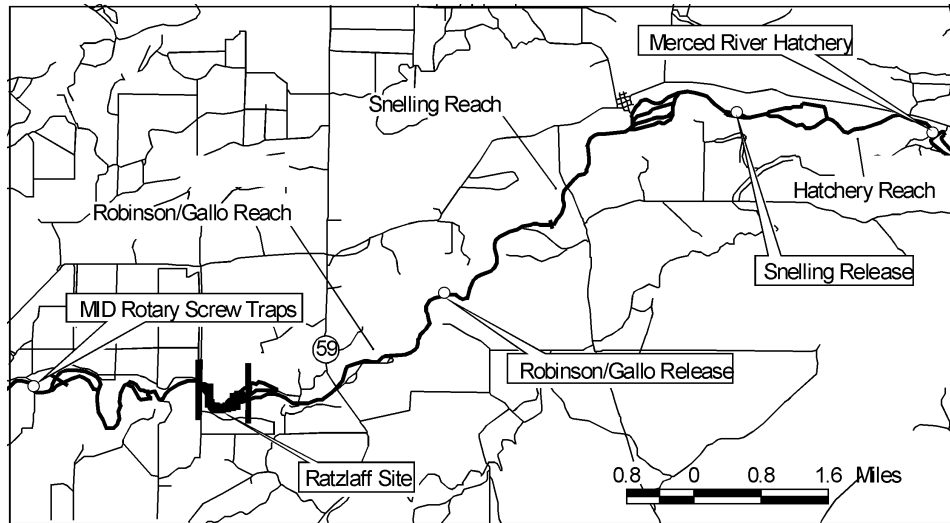


Figure 2. Merced River, 2000-2003 reach evaluation and release sites

The Snelling and Robinson/Gallo reaches have roughly equal numbers of diversions. Table 1 indicates the distance from the release sites to the RSTs.

Release Site	Distance to recapture site
Merced River Hatchery	15 miles
Snelling	12 miles
Robinson/Gallo	7 miles
Efficiency	.5 mile

Table 1. Distance from release sites to the RSTs.

Evaluation will be conducted by releasing fish above each specific reach to be captured at the RSTs. An efficiency release will occur 0.5 miles upstream from the RSTs to determine trap vulnerability (efficiency). All releases are timed so that re-capture will occur at roughly the same time owing to similar conditions for the test and control reaches. Survival rates from each release site will be analyzed appropriately to establish an estimate of survival along each reach. Releases will be conducted according to table 2.

Day 1: Evening Release Hatchery Reach Joaquin for	90,000 coded wire tagged fish released from the Merced River Hatchery. (These fish are part of a larger San Basin release and recoveries at the RSTs will be utilized project monitoring). 2 releases.
Day 2: Morning Release Snelling Reach	5,000 Photonic marked fish released from Snelling. 3 releases
Day 2: Evening Release Robinson/Gallo Reach	3,000 Photonic marked fish released from Robinson/Gallo. 3 releases.
Day 2: Evening Release Efficiency	2,000 Photonic marked fish released for efficiency testing of the RSTs. 3 releases.

Table 2. Release details. Release numbers are per release

These test periods will evaluate the treatment reach (Robinson/Gallo) and two control reaches (Hatchery and Snelling). The Hatchery Reach will be tested a third time if an appropriate number of fish can be marked for re-capture as fish availability is uncertain late in the season. Each test period will evaluate a different streamflow/water temperature condition. Release numbers increase with distance from the traps to maximize recoveries.

This testing process is similar to other reach-specific testing occurring in the San Joaquin Basin and is performed in conjunction with basin-wide survival evaluations. Survival and migration rates will be determined using a variety of techniques including the use of Program MARK software (Burnham K.P. and White G.C., 1997). These values will be compared to pre-project survival rates and rates among restored and unrestored reaches. A statistician will be engaged in the final design and evaluation of this program.

Objective 2 is to improve and increase salmonid spawning habitat.

Hypothesis 1: The ratio of downstream temperature to upstream temperature will decrease after the project is completed.

Monitoring/Data collection: Onset temperature recorders were placed in the Merced River at several appropriate locations at the beginning of project construction. These will evaluate temperature effects above, below, and within

the restored reach. A portable Hydrolab will evaluate the pond that will be isolated after the project is completed. Temperature recorders will be downloaded every 4 months and a temperature profile of the reach and the pond will be developed. Temperature recorders will remain in place for 4 years. Pre and post-project data will be compared and analyzed. Analyses will use an accepted temperature model to incorporate temperature profiles into salmonid habitat preferences. Physical cross sectional data, collected for geomorphic evaluation, will also be used to document changes in fish habitat.

Hypothesis 2: Spawning activity (number of redds and live fish) will increase within the project reach.

Monitoring/Data collection: Monitoring of the annual fall-run chinook salmon escapement is currently an objective of DFG's San Joaquin Valley Southern Sierra Region personnel. DFG annually estimates and monitors the adult chinook salmon escapement in the Merced River. Data currently gathered includes:

- A mark/recapture study to estimate population size, record fish lengths and determine sex.
- Estimation of the number and temporal distribution of redds per riffle.

These escapement surveys would continue and this data will be utilized to evaluate the biological changes associated with the project construction.

Coordination and integration: DFG, in conjunction with MID and other stakeholders, are developing a river-wide fishery monitoring plan. At this time rotary screw trapping takes place at 2 locations on the Merced River. Smolt survival studies using coded wire tags (cwt) and MadaJet marked fish have been established. Annual salmon escapement surveys have documented populations since 1953. These activities are expected to be integrated into the river-wide monitoring plan.

The monitoring at the Robinson site has been designed to compliment existing river-wide monitoring programs. It will also give biologists a chance to develop new methods and techniques (tagging, Program MARK analyses and numerical maximum likelihood statistics) for evaluation of salmon smolt survival, migration rates, and probability of individual capture. Also, the Robinson site is the second of a series of projects that will reconstruct 4.5 contiguous miles of the Merced River near Highway 59. As each sub-project is constructed, continued and additional monitoring of this 4.5 mile reach is planned. The monitoring proposed here will "dovetail" into the future monitoring plan for this reach providing a truer evaluation of project success or failure and eventually salmon productivity. Major and minor equipment purchased for this project will be utilized during monitoring of future projects in this and other reaches.

REFERENCES

- Burnham, K.P. and G.C. White, 1997. Program MARK - survival estimation from populations of marked animals. <http://www.cnr.colostate.edu/~gwhite/software.html>. Fort Collins, Colorado 80523
- Ricker, W.E. 1945. Abundance, exploitation, and mortality of fishes of two lakes. Investigation of Indiana Lakes and Streams 2:246-348.
- 1958. Handbook of computations of biological statistics of fish populations. Fisheries Research Board of Canada Bulletin 119.
- 1975. Computation and interpretation of biological statistics of fish populations. Fisheries Research Board of Canada Bulletin 191